30/PRTS

DEVICE FOR FIXING TO EACH OTHER OR ADJUSTING PARTS OR PIECES OF CLOTHING OR UNDERWEAR SUCH AS BRAS

The present invention applies to a device to keep parts of garments, undergarments, or any other accessory closed, arranged, fastened, and adjusted. Each part is equipped with a magnetic component suitable to interact with the magnetic component of the other part of garment.

The invention also applies to corresponding garments, undergarments, and accessories.

The invention has a particularly significant, nonexclusive application in the field of lingerie, for example: bras, garter belts, corsets. The device also applies to: hats, foldable portfolios, briefcases, bookbags, bags, hoods, necklaces, bracelets, adjustable watches, splints, medical belts, sweat belts, sporting instruments (weightlifting belts), bathing suits, diving belts, sport or walking shoes that can all use the magnetic components.

The magnetic or ferromagnetic components can be divided into two categories: soft materials which magnetizes easily (they have high permeability and can sometimes be demagnitized), and hard materials that, because of strong residual magnetization, are used as permanent magnets.

From this point forward the term magnetic component is used indifferently to denote soft materials or hard materials that form permanent magnets.

Let us note that a permanent magnet can be natural as well as artificial. As an artificial magnet, structure varies. Artificial magnets can also be formed more easily, and they can be adapted to the desired uses in order to make them have a stable magnetization that is more intense and more durable than that of natural magnets.

The next paragraph discusses the polarities or poles of the magnets that make up the magnetic components.

Every magnet has two opposite portions called poles, namely a positive pole or North Pole (tendency to orient towards north) and a negative pole or South Pole(tendency to orient towards south). In the process of their use in clothing, undergarments or accessories, the magnets of the system in one part of clothing are brought to interact with the magnets of the system in the other part by one of their opposite poles. To simplify, hereafter the magnet whose pole is arranged to interact with the magnet on the other part will be called a positive magnet, and the magnet with the negative pole, a negative magnet.

Devices are available to connect, to adjust and/or to fasten parts of clothing, such as dresses, bras or accessories such as shoes or belts.

Maintaing contact between, adjusting or closing clothing, shoes, or any other accessory is traditionally carried out by using buttons with buttonholes, buttons

with stirrups, snap fasteners, clasps, laces, eyelets, zippers or any other means of fastening or closing known under the brandname " Velcro ® ".

Such devices, which have been in use for a long time, present a stationary means of fastening, made up of male and female components that connect with each other and can have inconveniences.

These traditional devices are not easily adjustable, forcing the user to re-sew or remove components to get a good fit.

Additionally, their adjustment will always require alteration from the user, which can be difficult for some, such as handicapped people, pregnant women, the elderly or children.

There are also belts with a magnetic closing device (USA 5,307,582) which allow minimal adjustment. However, this device is not optimized and is complicated and expensive to use.

There is also a system (FR-A-2.492.938) for closing clothing made up of magnetic components fixed on rigid material, spaced out along the edges of 2 flexible ribbons.

Similarly, document FR-A-2.005.580 describes a closing system for a ski boot equipped with a magnetic safety device that prevents involuntary opening.

Generally, all these magnet systems only make it possible

to associate two parts, male and female components, which are in a predetermined position without the possibility of instantly modifying the position.

Devices are also available (WO/0013328) which allow for a fastening that can be modified, and these devices are generally satisfactory. But even these can still be improved. The magnetic components in these devices are made of metal that can be very heavy and uncomfortable. They may also generate a magnetic field of high intensity that still needs to be optimized.

In particular for underclothing, it is understood that a heavy bra-strap can be uncomfortable and/or a magnetic field that is too strong can present disadvantages, for example; possibly disrupting the function of electronic devices that are placed near the magnet, like a pacemaker.

The present invention aims to solve these disadvantages by proposing a device for fastening parts of clothing, underclothing or accessories, between magnets that fulfill, better than preceding devices, the requirements of optimizing the weight and the force of the magnetic field. It enables easier opening and/or closing of clothing, for example from a distance and/or awkward position, which allows for a better fit and greater comfort for the user.

Implementation and also the maintenance of the device (washing for example) are facilitated.

People handicapped either by their condition or their environment, or those that have to move a lot also benefit from the simple closing system invention that is reliable, inexpensive, and easy to use.

To this end, the present invention proposes a device to maintain in contact, regulate, adjust or close parts of clothing, undergarments such as bras and garter belts, or any other accessory. This device is made up of a first part that has a magnetic component and a second part that has a second magnetic component making it possible to fasten, regulate, adjust or close clothing, the undergarment or the accessory when one of the aforesaid first and second parts is used to interact with the other part. Each magnetic component is composed of at least two groups each one equipped with at least one magnet. The groups of the same magnetic component are fixed directly or indirectly on the same support and/or with each other, and are specialized to interact with the groups of opposing signs of the other magnetic component.

In advantageous methods of assembly, one can turn to one of the following provisions:

- At least one magnetic component is comprised of a first layer of ferromagnetic elements in soft material (215, 227, 237, dependent on groups of magnets (214; 225, 226; 236).

The first established layer being situated from side opposite to the other magnetic component;

- the two magnetic components consist of groups of magnets, the groups of the first component being appropriate to cooperate with the groups of opposing forces of the second component;
- the other component is devoid of magnets and is formed from a layer of soft ferrogmagnetic elements (216; 228, 229; 238);
- either the magnets of the component are not rigidly fixed to each other in an irremovable way;
- or the magnets of the component are fixed rigidly to each other in an irremovable way by joining or welding and/or are made of only one part, with sections of different polarities;
- each component includes at least two magnets per group, the positive magnets of a component are alternating with the negative magnets of the same component;
- the magnets of the same component are fixed side by side on the support;
- the positive magnets of the same component are placed on a different level from the negative magnets, which allows a link between the first component with the second component so that they interact with each other;
- the magnetic field of the higher level is beveled towards the lower level, to form a half dovetail;
- at least one magnetic element consists of at least one row of magnets inserted into a layer of elastic glue resistant to home washing, itself dependent on a supple or rigid support;

- at least one magnetic component consists of the pieces of the end of a larger thickness confering to the component a section in a U, these mentionned pieces are being arranged to cover at least in part the external sides of the magnets or of the ferromagnetic elements in soft material of the lateral end of the device;
- the first part includes a sheath in which the first component is inserted and is mobile, allowing for a multitude of adjustments due to the sliding motion of the first magnetic component in the aforementioned sheath;
- the second magnetic component is mobile and included in a second sheath pertaining to the second part;
- the second magnetic component is fixed to the second part;
- the first part and/or the second part includes two sheaths;
- the sheath is silicone on the outside to increase adhesion with the other part, or the resistance to the tearing apart at the level of fixing, what allows for the completion of the magnetic adhesion by a chemical type of adhesion;
- the sheath is reinforced and/or in a nonrectangular shape;
- one of the first or second parts is at least partly formed by a strap;
- one of the first or second magnetic components is formed by a magnetized zone of the aforementioned strap

belonging to the corresponding first or second corresponding component;

- the magnets of the magnetic component of one part of the device, are concave, and the magnets of the magnetic component of the other part, are convex - complementing the aforementioned concave form;

- one or more magnets of each magnetic component can be straight, trapezoid, rectangle, circular or triangular shaped;

- each magnet and/or magnetic component has an associated antimagnetic protection measure;

- the magnets come from rare metals family of type Néodyne Fer Boron;

- at least one magnetic element, or all or in part, is protected by Nickel or Gold galvanisation

- the mobile element in the sheath is guided laterally by strings or stem stitches which cross the mentioned element

- the first magnetic component is formed by a block at least partly hollowed out in an axial direction of at least a cylindrical hole and the second magnetic component is made of an identical block of dimension provided with a nub suitable to join with the hole in the opposite;

- the magnetic component consists of two cylindrical holes;

- the nub is central and/or smaller in size than the hole, which leaves a space between the walls of both after joining;

- the magnets are covered with an antimagnetic sheath on at least one side;

- the device forms a means of detecting and indicating closing or opening;
- the device has a release mechanism to alert or control in the event the given specific conditions are or are not met.

The invention also provides for clothing, underclothing and accessories comprising devices presenting one and/or the other of the characteristics described before.

Advantageously the bra consists of "double parallel sheaths ", which enable it to adapt to the activities and the movements of the user.

Additional support is consequently obtained with closing while allowing, in particular for big busts, a better distribution of the magnetic mass and/or traction. The double sheath indeed allows a greater range of adjustment thanks to the mobility of the magnets.

Also advantageously, the bra consists of a set of double long sheaths that allows for a highly reliable closing with two magnets per magnetic component.

In an assembly method, the bra consists of removable and adjustable straps, and/or the adjustment is in the front which makes it possible to bring the breasts closer together.

Advantageously, the closing is with a triangular sheath, which allows for a more precise adjustment and closing thanks to horizontal and vertical displacements of the magnet or magnetic component in the sheath.

Horizontal displacement, from right to left, undoubtedly makes it possible to bring the breasts closer or move them apart thus being able to offer more or less uplift, vertical displacement, from top to bottom, allows the bra to adjust according to the task. When the magnet or the magnetic component is drawn to the top, the bra is in a sport position. When the magnet or the magnetic component is drawn to the bottom, the bra is in a position for relaxation. If medium support is required, one adjusts the magnet or the magnetic component to the middle of the bra.

The triangular shape of the sheath also makes it possible to personalize the bra by placing the logo of the brand on the sheath.

Still advantageously, the bra has a back in the shape of " y ", the straps being removable or not, or the bra is part of the top of a one or two-piece swimsuit.

The invention also proposes a garter belt provided with a device as described before, characterized in that the low-grip consists of two mobile magnetic components in a sheath, which each one can be separated by a seam. Closing is done through connecting the two magnetic components at the bottom.

It also proposes a guépière provided with a device as specified above, characterized in that it consists of at least two sheaths, and advantageously five, each one composed of two magnetic components, a fixed and a mobile, separated by a seam. Each sheath passes through a loop of

rectangular shape a few millimeters larger than the sheath, and then is closed.

According to the invention, an accessory is a watch equipped with a device as described before. It consists of a watchband made up of two sheaths which each pass through a central loop. Each sheath contains two magnetic components, a fixed and a mobile.

The invention also concerns a cap equipped with a device consisting of, an adjustment strap which contains two magnetic components, a fixed and a mobile.

The accessory can also be a sport-shoe equipped with the device. It includes four sheaths in which each one passes through a loop, each sheath contains two magnetic components- a fixed and a mobile.

Advantageously, the shoe contains a tightening tongue and the closing of the shoe contains a part of the device, the mentioned tongue consisting of a magnet or a ferrogmagnetic element of soft mobile material and put together in order to open an close the degree of tightening of the tongue.

Also advantageously, the shoe contains two tightening tongues opposing the sheath and the magnet or the ferromagnetic element of soft and sliding lining.

The invention proposes as well a bag characterized which contains at least one device with a sheath which allows for the tightening/loosening of the opening of the sac and/or the

more or less tightened positioning of a volume flap.

The invention proposes as well a skirt with a belt equipped with two sheaths with magnets on a ferromagnetic element in soft sliding material, put together for cooperating with a magnetic component fixed on the opposing side.

The invention will be better understood after reading the description which follows on assembly methods given through non-restrictive examples. The description refers to the drawings which accompany it in which:

- Figures 1a, 1b, 1c and 1d are diagrammatic blueprint representations, giving first assembly methods of devices according to the invention.
- Figures 2a and 2b show front and back, a bra according to an assembly method of the invention.
- Figures 2c and 2d show a frontal view of a bra according to an alternate assembly method of the invention, and the details, from the top and by the section, of closing.
- Figures 2e and 2f give other assembly methods of the device according to the invention.
- Figures 3a, 3b and 3c show in side views two assembly methods of magnetic components for the device according to the invention.
- Figures 3d, 3e, 3f and 3g give several magnetic assembly methods.
- Figures 4a to 4d represent the form of positive and negative magnets, according to another assembly method.

- Figures 4e to 4h give other assembly methods of magnetic components and their support according to the invention.
- Figures 5a to 5f show another assembly method of bras and their closing system according to the invention.
- Figures 6a to 6f give other assembly methods of bras according to the invention.
- Figures 7a to 7d show another assembly method of bras according to the invention.
- Figures 7e to 7h represent a bra and its strap-adjusting system according to another assembly method.
- Figures 8a and 8b respectively show a bra and an adjusting device which are applicable according to an assembly method of the invention.
- Figures 9a to 9h give other assembly methods for bras using the invention.
- Figures 10a to 10d show a watch according to an assembly method of the invention.
- Figures 11a and 11b give another type of frontal fastening of the cups for a bra.
- Figures 11c and 11d illustrate a cap according to an assembly method of the invention.
- Figures 12a, 12b and 12c show a device according to an assembly method of the invention, for garter belts.
- Figures 13a to 13d show from an angle (13a, 13b, 13c), and in a cut view (13d) different assembly methods of the rectangular sheaths usable with the invention.

- Figures 14a to 14c give cut views of a magnetic component as a strip used with the invetion (fig. 14a) and of a mold to form such a component (fig. 14b), the figure 14c showing the whole thing from an angle.
- Figures 15a to 15h show, as a cut view or from an above view, assembly methods of a magnetic component according to the invention, alone (figures 15a, 15d), overlapped on a complimentary element (figures 15b, 15c), in an above view on several rows (figures 15e, 15f, 15g), the figure 15h being an enlarged view of figure 15a.
- Figures 16a and 16d show magnetic elements in a cut view (figures 16a, 16c, 16d) or in a view from above (figure 16b) consisting of magnets of different heights, according to different types of applications of the invention.
- Figures 17a and 17c give cut views of magnetic (complimentary) elements according to other applications of the invention (17a and 17b) the figure 17c showing the mentioned magnetic element from an angle.
- Figures 18a to 18d show in a cut view the complimentary magnetic elements of other applications corresponding to the magnetic elements of the figures 17.
- Figures 19a to 19c represent as a sketch the forces of the magnetic fields of the type which is shown in the figures 17 and 18.

- Figures 20a to 20d show in cut view, other applications of magnetic elements for which the invention can be used for.
- Figures 21a and 21b give a cut view of other applications of magnetic elements for a device according to the invention.
- Figures 22a and 22b show respectively asd a cut view and as a view from an angle two magnetic elements which belong to a device according to another assembly method of the invention.
- Figures 23a to 23c give in cut view usable magnetic elements with an assembly method of the invention "in action" between the position "loosened" and the position "tightened".
- Figure 24 shows, in angle from behind, a shoe equipped with a device with diodes according to an application of the invention and the detail of the corresponding tongue.
- Figures 25 and 26 show, seen from an angle, two tongue types with diodes that can be used with a shoe of the type in figure 24.
- Figures 27a, 27b, and 27c give schematic views from an angle and as cut views of a watch bracelet held together by a double-magnet device according to an assembly method of the invention.
- Figures 28a and 28b show on the one hand the sketched schematic cut view of a shoe tongue and on the other hand the mentioned shoe seen from an angle according to an assembly method of the invention.

- Figures 29a to 29c give views from an angle of a shoe according to the assembly methods of the invention, with double tongues opposing each other.
- Figures 30a, 30b and 30c and 31a to 31c show from an angle two assembly methods of the device for bag closures, according to the invention.
- Figures 32a and 32b show from an angle and as an enlarged view for figure 32b, an assembly method of the device according to the invention for a garment of the skirt type.
- Figures 33a and 33b show from an angle a jacket respectively opened and closed; equipped with a closing device with a sheath according to another assembly method of the invention.

From now on one will use if possible the same reference numbers to indicate the same or similar components.

The magnets used in the assembly methods of the invention described in more detail here preferably contain Néodyne Fer compressed Boron of density 7.3 to 7.5 g/cm3, the coating of the magnet can be obtained through an alloy containing nickel, zinc or tin and copper.

One of the difficulties of this invention was guaranteeing the correct operation of the magnets over time.

Taking into account the aging of magnets (which have an asymptotic limit) when they are subjected to washing and significant temperature, out-of-date magnets are used.

This problem was fixed in the invention by using the advantageous manufacturing process of magnetic materials containing usable rare metals that follows.

The various raw materials for the alloy are first mixed with a high degree of accuracy, under a vacuum or under inert gas.

For example, one mixes the components according to following preparations in mass of Neodymium iron boron: 33% to 35% of Neodymium, 64 to 66% iron and 1,1% to 1,3% of boron.

The primary product can be obtained by fusing the components or reducing in a calciothermic way, for example: towards 1300°C starting from a fluorinated compound iron NdFe and chloride FeC13 (NdF3+Ca+FeC13- < (NdFe)+CaCIF+CaFe2).

The raw material particles are crushed until they react to very precise tolerances (grains of about 1 micron).

Then, the products are stamped by forcing a powerful magnetic field to direct the metal particles.

Finally, the components are sintered in a special furnace under a vacuum with 1050°C, or under argon.

After a fast cooling, temperatures are raised (600 to 900°C) before finishing the cycle with a fast hardening.

Finishings are then carried out with flash manufacturing machines or with machines equipped with diamond tools because the end product is very resistant.

Among other usable materials, one notes the Samarium Cobalt (SmCo5, SmCo17) and other types of Neodymium Iron Boron (Nd2F14B), which are magnetic materials containing rare metals that are highly effective.

In order to avoid oxidation, the end product in Neodymium Iron Boron is galvanized once (Ni, Sn or Zn) or three times over (Ni+Cu+Ni)(Sn+Cu+Sn) or (Zn+Cu+Zn) or advantageously Ni + Ni + Au ou Ni + Au.

In the case Nickel or Gold galvanisation, one retains for example depths of 0,01 mm of Nickel and 0,001mm of Gold.

The magnets can be covered one by one with a protective layer also obtained through the galvanization of nickel/copper or nickel/epoxy, or any other galvanization which will prevent the magnets from rusting.

These magnetic materials of higher quality are used in cases where one needs a very high magnetic force and have five times less space than with hard ferrite magnets of the same magnetic power.

Figure 1a shows a device 1 to maintain in contact, to regulate, adjust or close parts of clothing, undergarments or any other accessory that includes a first part 2, includes at least a sheath 3, into which a first magnetic component 4 is introduced.

According to an assembly method of the invention, the first magnetic component 4 consists of two magnets stuck together, namely a first positive magnet 4 ' and one first negative magnet 4 ' ',

and is mobile inside the sheath which consists of a double band of 1 cm of width out of fabric.

Device 1 includes one second part 5 comprising a second magnetic component 6 made up of two magnets, namely a second positive magnet 6 ' ' and a second negative magnet 6 ', which will be able to interact with the first magnets of opposite signs 4 ' and 4 ' '.

As shown in reference to the arrows 7, the first magnetic component 4 whose width is smaller than the width of the sheath, will be able to slide in the aforementioned sheath 3 between different positions, with a multitude of adjustments being possible.

Taking into account that two polarities are present on the same magnetic component, the fastening between the parts is more solid, and weight and magnetic fields are equal, at the same time more extreme and easier to demolish, than with unipolar magnets.

The magnets of each magnetic component are fixed for example by joining them to a support (not shown), that is flexible, for example made out of plastic material, which allows them to link to each other according to a preferred assembly method of the invention.

Shown in figure 1b is a second assembly method of device 8 including two parallel sheaths 9 and 10, for example consist of pipes or fabric tubes of the same width and longer in length, the aforementioned tubes being situated or likely to be

situated vis-à-vis at the time of implementing the device, to close or adjust two open parts of clothing.

These two sheaths 9 and 10 respectively, belong to a first and second part of the device 8 to which they are fastened.

Sheaths 9 and 10 each include a magnetic component 11 and 12, each one made up of two magnets of opposite polarities, glued to a support (not shown), namely and respectively a positive magnet 11 ', 12 ' ' and a negative magnet 11 ', 12 ', the two components being specialized to interact one with the other, to allow a double fastening, which is for example beneficial in certain assembling methods of belts.

Figure (1c) shows a third assembly method of the device 13. Device 13 consists of a first part 14 made up of two sheaths 15 and 16 coupled top to bottom with one another, containing two identical magnetic components 17, the aforementioned magnetic components each one made up of three magnets, namely two positive magnets 17 ' and 17 ' ' ' framing a negative magnet 17'', suitable to interact with two magnetic components 18 pertaining to a second part 19 of the device, and each one made up also of three magnets, namely a positive magnet 18 ' ' framed by two negative magnets 18 ' and 18 ' '.

The second part 19 is formed from two identical small pockets 20, remotely opposed one from the other, and fixed at one or more points in the clothing, for example out of fabric, suitable to be

laid out opposite respectively to the two sheaths 15 and 16.

The magnetic components 18 are fixed here, for example by gluing and/or simply blocking a portion of the small pocket at its end, for example via seams 21.

Figure 1d shows another assembly method of the device 22 according to the invention including a first part 23 comprising two mobile identical sheaths 24 which consist of two identical magnetic components 25, suitable to move inside the sheath according to arrows 26.

Device 22 includes one second part 27 consisting of a strip forming two small pockets 28 equipped with two central parts 29, whose two magnetic components inside 30 are blocked.

Here, each magnetic component respectively includes a positive magnet 25 ', 30 ' ' and a negative magnet 25 ' ', 30 ', suitable to react with each other, according to their respective polarities. In this assembly method, the magnets of the same magnetic component are fixed rigidly with each other.

Looking at figures 1a to 1d, it is understood that when the magnetic components and therefore their respective magnets are brought to unite through an air-gap consisting of sheaths that are one or maybe double in thickness or bands in which the (aforementioned) components are in, the sheaths are fastened to a part of clothing, shoe or another accessory, and can be moved with

the aforementioned part of clothing along with the other part of clothing that is fastened to the second part, which will allow adjustment thanks to the sliding motion of the first magnetic component in the sheaths.

In the assembly method shown in reference to figures 1a to 1d, the magnetic components are cut into a rectangular shape.

Figures 2a and 2b show an undergarment, mainly a bra 31 partially equipped in the back with a device 32 to hold the bra up. This device includes two parallelepipedic identical shaped magnetic components 33 suitable to interact with each other. They are superimposed on the figure.

Components 33 have larger dimensions in length compared to their width and/or their thickness, for example more than five times, and particularly more than ten times larger.

Figure 2c shows another assembly method the bra 34 which includes two magnetic components 35 suitable to cooperate with each other.

In this assembly method, to assure the fastening, the two magnetic components 35 can for example be on the same strip 36, which passes through slit 37, ending at the end 38 of other strip 39, of the closing.

The two magnetic components are separated between them by seam 40.

In this assembly method, the magnetic components could be replaced by two identical magnets. Figures 2a and 2f give

other assembly methods to "double" magnetic components on both sides, using sheaths.

Figure 2e shows a device 41 equipped with two parallel identical sheaths 42. The sheaths are parallel in order to distribute the mass and the traction exerted by torso measurement of the user's back. Each sheath 42 includes at its end 43 a first non-sliding magnetic component 44, separated from the rest of the sheath for example by a seam 42. The sheath includes on its other part a second sliding magnetic component 46.

The system allows a double sliding motion according to the magnetic components that interact, (cf figure 2e arrow 47), that allows for a better hold because closing relies on four magnets. In this case, one obtains a offset closing, on the sides of the spinal column, which makes it possible to avoid the direct shocks to the latter.

This system also allows a second type of closing, which is larger, and occurs only when the two sheaths are put end to end (arrow 48).

Figure 2f shows as a device 50 with sheaths 51, and magnetic component 52, the sheaths form at the ends of the straps connected to the remainder of the bra by rubber bands 53. In the assembly methods 2e and 2f, the magnetic components could be replaced by unipolar magnets.

The figures 3a and 3b show a first assembly method a magnetic component 54,

parallelepidedic, of 1cm X 1cm for example, usable with the invention. In the figure 3b, at least one magnet or flat magnetic component 55 of parallelepidic shape, is glued on another larger magnet 56 which can be of parallelepidedic shape. One then obtains a staircased magnetic component 57.

The magnet or magnetic component correspondent of the other part is identical but reversed in polarity, which makes it possible to fix the magnets in a top-to-bottom way and to obtain a complete rectangle (cf.3b). The unit thus obtained can be conceived of only one part by moulding or fitting, which avoids the eventual problems of brittleness from gluing;

The figure 3c represents a device completed on a method identical to the precedent, the difference being that the interior field 59 of the small magnet 60 is bevelled. One then obtains a magnet 62 in a half dovetail.

A magnetic component is an ensemble of magnets assembled through magnetic contact or by gluing in order to form a "block" of magnets. These magnets are generally parallelepidedic and are glued by section (the least significant surface of the parallelepide). The unit obtained is not very stable. When they are not fixed with each other by more rigid means, a movement or a shock leads the magnets to position themselves one against the other across the greatest surface of the parallelepiped.

To preserve flexibility and stabilize the block, a manufacturing process can be implemented and is described below.

According to a favourable assembly method the invention, the magnets are assembled by side contact (on the smallest side of the magnet) and to form a multipolar block 62 (cf.fig.3d).

Magnets 63 ' are kept up between each other through magnetic contact and a special known adhesive 64, which adheres to the surface of magnets. Advantageously, preferably a support or fabric 65, for example made up of a groundwork and/or plastic film (cf.fig 3e) stuck on the lower surface of the magnets (adhesive in feature stopped on the figure 6b).

In this manner,one obtains an assembly made up of three layers; firstly, magnets 63 secondly adhesive 66 and thirdly, support 65.

Everything permits a block-joint. As a specification, the magnetic component or the block can have 2,4,6 magnets or as many as necessary. The block-joint has a significant advantage because it will be able to adapt to rounded shapes or bodies 67 (cf.figure 3g).

It also allows the magnets to stay in contact.

Advantageously when the magnets are laid out vertically, the bending of the blocks is vertical.

One uses in this case rectangled parallelepipedic shaped magnets placed vertically, each magnet stuck (through magnetic contact) to the next magnet by the longest side; the magnets placed end-to-end make up a

vertical flexible block; it is the most commonly used method to assemble figure 3d.

Figures 3a and 3f show an alternate fitting of positive and negative magnets glued on a support (not shown) according to a method identical to the previous. Here one uses magnets 68 and 69 in the form of rectangles that are not as long or squares placed end to end on two lines or more. The block made up is therefore flexible vertically and horizontally.

Figures 4 to 4d show two complementary magnetic components 70 and 71, usable with the invention, which are very powerful because they generate an effect which can be compared to that of a suction cup.

The two components present the characteristics specific to the magnets previously used for specifically exploiting different magnetic fields.

The assembly method follows:

It is composed of three parts:

a) the large base disc 72

b) small disc 73

c) ring 74.

The magnetic component 71 is made up of a flat and circular magnet i.e. the large basic disc 72 to which one adds in his center a smaller circular magnet, or small disc 73, being able to penetrate in the ring 74 which is opposite. As a suggestion, for disc 72 with 18 mm and height of 2 mm, the small disc 73 will be 5 mm in diameter with a height of 1,5 mm and the ring 74 will have an

external diameter of 18 mm, an internal diameter hole 75 of 9 mm for a height of 2 mm, the proportions vary according to power needed.

Power is a function of the size of magnets used, the bigger the magnet the more important power is. The magnetic field of the suction cup is really specific, it acts from the interaction between the fields of the magnets used.

Large disc 72 is a bipolar disc, magnetized in an axial way (northern above and south below).

Small disc 73 is a bipolar disc, magnetized in an axial way (northern below and south on-top), but it can also be reversed, meaning that the large disc and small disc can be magnitized similarly.

Ring 74 is hollow in its center, this hole gives the ring a specific magnetic field (cf arrows 76).

The ensemble of these magnetic fields is represented with fig. 4d and makes it possible to precisely join body curves or hard body parts like bone.

Figures 4e to 4h, represent an arrangement of magnets 77,78, identical to that of the block of the figure 3f but this time, cylindrical shaped magnets are used.

Inflection is possible in three ways: horizontal (feature stopped 79 on fig.4e) vertical (feature stopped 80 on fig.4f) or diagonal (feature stopped 81, 82 on fig. 4h).

This block also has the characteristic to present very round external stopping. It makes it possible to exploit a new principle of inflection based on a possibility of diagonal torsion joining a number of shapes more significant than the two magnetic blocks or components cited previously.

Figures 5a to 5b represent a bra 83 equipped with a device with parallel double sheaths 84 and 85.

This arrangement allows the bra to adapt to the activities and movements of the user.

She (the user) is ensured of additional support at the time of closing and allows a distribution of pressure due to fastening. In addition, from the mobility of the magnets the double sheaths allow for a diversity of adjustments 86, 87 and 88 (cf fig. 5d-e-f).

An attribute of the bra with double sheaths (see fig. 2e) is to ensure a highly reliable fastening (more reliable than with only one magnet). The two additional sheaths allow for a length of adjustment that is twice as long than using the single sheath.

Moreover, this device makes it possible to fasten past the manufacturers predetermined limits. Finally, it adds additional support because when the fixed limits of the sheath are passed, the fixed magnet 44 does not come into contact with the mobile magnet 46 and will clamp down on the second fixed magnet(cf appears 2e).

Figures 6a to 6f show another assembly method for bras 90 with a system of sheaths in the shape of " y ", i.e. including a dorsal strap 91 in shape of " y " whose base plate (92) can be either round (fig.6a) or right-angled (fig. 6b).

The magnetic components or magnets 93 in each of the two branches 94 of the " y " are mobile (fig.6c-d) and are closed by sliding and from traction between two fixed magnetic components or magnets 95 (fig.6c-d) contained in the bra straps 96. This system assumes the common frontal closing under the arm.

In an assembly method, the sheath system 97 is known as "elevator"(fig.6e).

A vertical and dorsal base joint 98 contain a magnetic component or magnet. The left and right-hand side straps have a magnetic component or a magnet at their ends 99.

The straps join with the interior side of the base joint (arrow 100 - fig.6f) or outside (arrow 101) at the user's convenience.

A rubber band (not shown) placed in the base joint and fixed to the magnet of the previous makes it possible to slide and in this manner to move the magnet from the joint base to which the straps were joined, which makes it possible to simultaneously tighten the right and the left strap.

Bra 102 " with frontal closing and adjustment" is represented in fig. 7 a-b. It allows not only closing but also brings the cups together 103 (cf.fig. 7d) and

thanks to the triangular sheath 104 (cf.fig. 7c) described below, allows for an innovating adjustment.

Indeed, the bra market answers in a traditional way to respond to customers who act according to their body types. There are several types of figures: breasts that are far from each other, an intermediate position, and finally breasts that are closer to each other.

Today, brands share customers according to their choice in cup positioning (spaced apart, at a medium distance, brought closer together). Thus a customer who specifically wishes to bring her breasts closer together is obliged to change brands.

The system described makes it possible to close then adjust.

Thanks to an assembly method, it is possible to satisfy the customers described above as well as the customer who wishes to change the aspect of her chest (for example to give the effect of a plunging neckline)

Frontal closing (cf figure 7c) with a sheath in which the form extends in length and in width, will allow closing with various possible types of sheaths.

The rectangular sheath also allows for precise adjusting and closing around the bust and that is thanks to a horizontal displacement of the magnet in the sheath.

The triangular sheath 104 (cf.fig. 7c) allows for an additional adjustment of the bra thanks to a displacement

that is horizontal and vertical of the magnetic component or magnet 105 in the sheath. Horizontal displacement, from right to left, then makes it possible to bring the breasts closer or move them apart, allowing here the possibility of having a plunging neckline.

Vertical displacement, from top to bottom, allows for an adjustment according to the task; when one draws the magnet to the top, the bra is in sport position, when one draws the magnet 105 to the bottom, the bra is in a position for relaxation.

If one wishes a " median " tightening, one adjusts the magnet in the medium.

The triangular shape of the sheath also leaves room for personalizing the bra by placing the logo of the brand on the sheath.

Figures 7e to 7h illustrate methods of additional adjustments, this time with straps 106 either/or on the back (107) of the bra (108), which can be paired with the methods of adjustment corresponding to those illustrated in reference to figure 7c.

Figures 7g and 7h illustrate the use of magnet 109 in the form of blocks, whose magnetic component is fixed and the other is mobile in a sheath 110 joined to the strap and/or to the back 111 of the bra 108.

The straps are effectively completely removable by means of hooking 112 described once again in reference to figures 7g and 7h. More precisely, the straps whose ends

are made of rigid nylon, pass between the interior of the cup 113 and a bent fabric 114.

Figure 8a shows an S-type bra previously described with straps B and girdles C whose two ends E are either closed by a device of the type described in figure 1, or by a device with three magnets, namely the magnets or magnetic components A_1 A_2 A_3 for example rectangular, flat, placed in the same sheath F that allows a snake-like configuration, folded in double V, magnets being opposed to each other to allow an optimized and reproducible adjustment, once the magnets are locked in position in the sheath F for example by a seam.

Figures 9a to 9h illustrate a bra 115 with removable and adjustable straps 116 according to other assembly methods for the invention, and are able to remove and adjust the straps to obtain the correct size, to cross the straps in the back (fig.f) or across the chest (fig.9e) of the user and can be used alone or combined with adjustment methods as described in reference to figures 2.

Figure 10a shows a watch strap 117 including a device made up of two sheaths 118 and 119 which pass through a central loop 120, each sheath contains two magnetic or magnetic components, one fixed 121 and one mobile 122. This device makes it possible to fix and adjust the watch according to the method of the invention described in more detail.

Figure 10b represents a sheath-strap 123 which passes through a loop 124 joined to the watch. This sheath contains a magnetic component

or fixed magnet 124 and one mobile magnetic component or a mobile magnet 125. The sheath is folded up on itself to lock the unit.

Figure 10c shows a sheath 126 including a fixed magnet 127 and one mobile magnet 128 which passes through a half-strap 129 ended by a loop. Closing is the same as the previous.

Figure 10d represents two sheath 130 one contains one fixed magnet or magnetic component 131, the other has a mobile magnet or magnetic component 132 in a sheath.

Figures 11a and 11b show a bra 133 including a sheath 134 with return 35 and reinforcement 136.

This device answers the criteria mentioned above to which the following characteristic is added:

A sheath 137 containing a magnet 138 comes to superimpose on the sheath 139 containing a magnetic element or a magnet 140 with a return 136 equipped with magnet 141, which increases the magnetic power and can act as ornament, for example, by adding lace on the aforementioned sheath of reinforcement. This sheath can also display the logo of the brand.

Figure 11c describes a cap 142, including an adjustment strap 143 which contains two magnetic components or magnets 144, 145, one fixed 144 and one mobile 145. The strap passes through a loop 146 and is folded up on itself to ensure the adjustment.

Figure 11d shows a cap 147 with two adjustment straps 148 and 149 each one contains a mobile magnet or magnetic component.

The adjustment is obtained while placing the straps one against the other.

The garter belt of figure 12 shows a device which prevents tearing from the bottom.

It is placed and removed more easily than the traditional system. Replacing the low-grip uses two mobile magnetic components or magnets 151 in a sheath 152, which can be separated by a seam 153.

Closing on the stocking happens through the locking of the two magnets or components.

The system of height adjustment can be done with a fixed magnet or magnetic component 154 and one mobile 155, which slides in a sheath 156. The magnet or variable component allows an adaptation to the person's measurements but especially, answers and adapts to the various types of figures.

The guêpière (not shown) can consist of five sheaths each one made up of two fixed magnetic components or magnets, and a mobile separated by a seam. Each sheath passes through a rectangular loop a few millimetres larger than the size of the sheath, then the sheath is closed on itself.

From hereafter and in a nonrestrictive way, is a description of various methods of rectangular sheaths usable with the invention, in reference to figures 13.

Figure 13a shows a sheath heavy purl stitched made out of a jersey ribbon 160 and one nylon ribbon 161 which are stitched 166 and reversed.

One introduces a band of celluloid rhodoïd 167 into this pocket, then closes the hole through peripheral stitching 168.

Figure 13b describes a stitched sheath that is reversed. One uses here a nylon 169 band whose sides are glued in order to obtain a hem which will reinforce the sides of the sheath. This hem can be replaced by cutting with the ultrasound. The band is then folded up on itself (arrow 170) lengthwise with an excess at one of the ends by a few millimetres.

One then stitches 171 on the two long sides 172 and the bottom of the pocket 173 obtained.

Two bands of celluloid rhodoïd 174 2mm broad and glued are placed along the large sides of the sheath. The sheath is then reversed (arrow 175) then stitched in 176 to trap the two bands of celluloid rhodoïd and to guide the movement of the magnet (not shown) in the sheath thus obtained 177.

Figures 13c and 13d show a silicone sheath 178, processed to increase adherence.

The contact surface of the sheath with the adjacent sheath can be covered with silicone 179, rubber or semi-adhesive matter, in order to increase adherence between the sheaths that are in contact. One thus slows down the movement of the sheaths and one increases the pulling force by creating a suction cup effect.

Nylon 181 coats the inside 180 of the sheath to facilitate the movement of the magnetic component 182. The visible exterior 183 of the sheath is in covered jersey. The assembly can be done by stitching or welding (hot or by ultrasound) (arrow 184).

The nylon and the jersey are assembled by using a heat sealing 185 to obtain a first part of sheath. The second part is made up of nylon in the interior which is covered with a layer 179 of silicone. According to the silicone reaction to the ultrasounds, this one will be applied before or after the welding.

This sheath can have a specific shape, in order not to obstruct the mobility of the magnet in the sheath. The edges of this sheath can be reinforced with heat sealing on the sides.

Figure 14a shows a cut view from the magnetic element 186 for the device according to a way of creation of the invention, composed of one or several rows of magnets 189 (here 2 rows are shown) fixed on a support 187 by the intermediary of a known type of glue 188. The support 187, for example in polyester film of a thickeness of 0.2 mm, present different characteristics:

- Good resistance to humidity (washing) and to chemical agressions (detergents, transpiring, basic and acidic environments),
- suppleness in order to accompany user's movements

- sufficient stiffness to allow the device to retake its initial form after bending out of shape,
- good adhesion to the glue 188,
- Reduced thickness

The glue 188 presents different characteristics:

- resistant in environments that are humid (washing) and chemically agressive (detergents, transpiring, basic and acidic environments),
- good adhesion to magnets 189 and to support 187,
- supple and resistant to shocks,
- easy to mold for what allows for a good setting of the magnets,
- resistant to hight temperatures (>200°c)

As an example, one can use a glue with a silicone base resistant at 250°C.

Figure 14b shows a cut view fromp mold 190 in a plastic material allowing for the creation of a magnetic element 186 in bands of different lengths.

The body of mold 190 posseses 2 slots or gutters 192 and 194.

Gutter 192 has the form of the magnetic element 186 to obtain.

Gutter 194 allows the insertion of flat element 193 of ferromagnetic material; or a lengthened parallelepedic form that the utility will be developed after.

An intemediary element 191 is placed in a mold on the internal face of gutter 192. It plays

an anti-adherent role, preventing the glue to adhere on the mold 190.

Component 191 is for example formed from a plastic film, for example in polyethylene.

Other mold assembly methods are possible. For example, in aluminum with a coating of a known material under the brand "Teflon®", or a mold entirely in polyethylene. In this case, one can avoid the presence of film 191.

One will now describe the fabrication of magnetic element 186, according to an assembly method of the invention.

After having arranged the anti-adhering element 196 in gutter 192, one places different rows of magnets 189 that are thus naturally plated on the bottom of the gutter 194 thanks ot the magnetic attraction exercised by the element 193 aranged at the bottom of gutter 194.

This placement allows for the avoidance of the deplacement of magnets 189 as the injection of the aforementioned glue 188.

After having recovered the magnet rows 189 with glue 188, one places the support band 187 on the superior force of the layer of glue in this way formed. Then one comes to create the rounded off superior part of the band, and one can leave it to dry.

The drying can occur naturally (in free air) having heard that a lightly humid environment facilitates the polynerisation of this glue, or by a forced method (oven, heating resistances, ventilation or any other system). The operation of

the "casting" of the block magnets with the glue can make the underneath empty; in a free atmosphere or in all other conditions of temperature or pressure advantages.

Figure 14c shows a view in an angle view of the magnetic component 186 in its mold 190. The glue 188 and the support 187 are hidden on a half view.

Figure 15a shows a magnetic component 196 constituted of negative magnets 198 and positive magnets 199 in alternating order, the negative magnets and positive magnets having different thicknesses. Magnets 198 and 199 are glued on a support 201 with a known type of glue 200.

The figure 15b shows 2 complementary magnetic elements 196 and 197 constituted as described above with negative magnets 198, 198', and positive magnets 199, 199'. The complementarity of form between the magnets 198 and the magnets 199 allows for a fitting of one with the other since the magnets 198 are placed faced towards magnets 199', and the magnets 199 are placed faced towards magnets 198'.

Figure 15c shows an enlarged view of 2 magnetic components 196 and 197 that are respectively inserted into sheaths 202 and 202' and that can be mobile or fixed on the inside of these.

The sheaths 202 and 202' are in fine fabrics (for example of the order of 75 to 80 microns of thickness) supple, light and resistant so as to allow a maximum approach of surface elements 196 and 197.

Although at first more complicated, this arrangement of magnets 198, 199, 198' and 199' present the following advantages:

- Permits a physical cross sticking together of elements 196 and 197, one in relation to the other, thanks to lateral sides 203 of magnets 199 and lateral sides 203' of magnets 199', forming a crossing stop.
- Increases magnetic strength of the whole in increasing the contact surfaces between magnets 199 and 199', the surfaces of the lateral faces add to the horizontal surfaces.
- Increases the pinching of the sheath fabric 202 and 202' in obliging the fabric to follow the form of magnetic elements 196 and 197. This pinching allows to better stop the sheaths once the garment is adjusted and closed.

The figures 15d to 15g show examples of different organizations, for the magnets 198 and 199, on one or several rows.

Here one uses magnets 186 and 187 in the form of square or rectangle parallelepides placed end to end in alternating negative and positive magnets of different thicknesses.

More precisely, figure 15d shows a magnetic element 196, seen above, where magnets 198 and 199 are alternated in one single row. The polarities of magnets are equally alternated in such a way to increase the magnetic power of the block.

Figure 15e shows a magnetic element 196 seen above, with magnets 198 and 199 alternated on two symmetrical rows. The polarities of magnets are always alternated but according to two dimensions and whatever the type of magnet.

Surprisingly, this alternating of polarities allows a factor gain of 10 of the magnetic strength.

Figure 15f shows magnetic element 196, seen above, in which magnets 198 and 199 are alternated on two rows and following two dimensions forming in this way a "check pattern".

Figure 15g shows magnetic element 196, seen above, when the magnets 198 and 199 are alternating on three rows and following two dimensions forming in this way a "check pattern" of a larger lateral dimension.

The number of rows of magnets by row are not exhaustive and depend on the desired strength for a given application. The magnets can be placed either in a symmetric fashion or in a "check pattern" whatever the number of rows.

Figure 15h shows a parametered view of magnetic component 196. Surfaces in contact depend on the thickness difference of two magnets 198 and 199, noted by x for given dimensions of the magnetic closure.

As added information, for a magnetic element with two rows of for magnets each, with $\beta=\gamma=3mm$, $\delta=0.5mm$, $\varepsilon=1.5mm$, or $\alpha=1mm$ and $\xi=6mm$, one gets

- for a symmetric alternating, a surface contact of $180mm^2$
- for an alternating in check pattern, a surface contact of $192\ mm^2$
- for a magnetic component with magnets of the same thickness either $\varepsilon=\delta=1mm$ and $\alpha=0mm$, a contact surface of $144\ mm^2$.

For an even volume of magnets, in relationship to the classic configurations (even thickness) the symmetric alternating allows for the increase of contact surfaces of a factor of 1.25 and of 1.33 for the alternating in check pattern.

Figure 16a shows a magnetic element 204 constituted from an alternating of negative parallelipedic magnets 206 and positive magnets 207, that have different thicknesses, of a double type of alternating, that is to say that the row or rows are constituted of a succession of two magnets 206 and two magnets 207 then two magnets 206. The magnets 206 and 207 are glued on the support 209 fo the type described before, with a known type of glue 210.

Figure 16b shows views above of magnetic component 204 on one or two rows. Polartities of the magnets are always alternating according to one or two dimensions and some by type of magnet. Each magnetic element can have one or several rows of one or several magnets according to the desired magnetic strength.

Figure 16c shows an enlarged view of two complimentary magnetic components 204 and 204′ that are respectively inserted into sheaths 211 and 211′ and that can be mobile or fixed on the inside of them. Sheaths 202 and 202′ must be fine, supple, light and resistant in order to permit a maximum approach of surfaces of 204 and 204′.

This organization of magnets 206, 207, 206' and 207' presents the same advantages as for the case of simple block alternation of figures 15 are either:

- Exclent physical sticking together
- Increasing of contact surfaces and therefore magnetic sticking is also increased
- Better pinching of the sheaths

Figure 16d shows a magnetic element 205 composed of a triple alteration of magnets 206 and 207 of different thicknesses fixed as before.

To optimize the magnetic strength necessary for each application, one can therefore vary different parameters:

- type of alternating of magnets (single, double, triple),
- number of rows,
- number of magnets per row,
- thickness of the magnets.

Here one sees the very large palette of solutions that the invention can present, particularly in certain types of applications.

Figures 17a and 17b show another way of creating magnetic complimentary magnets 212 and 213 usable with the invention that are performing because they generate an effect of locking away of the magnetic field in positioning a row of ferromagnetic elements 215 and 216 in soft material.

The magnetic component 212 is composed of one or several rows of magnets 214 that are glued, sodered, or otherwise fixed by the bias/cross of an element

218'' (double face adhesive for example, of a known type, to ferromagnetic elements 215 in soft material).

The whole thing is fixed on a support for example supple in a plastic material, 217 with a known type of glue 218 as previously described.

The block in this way constituted can be inserted in a sheath 219 of cloth of another material in which the block can deplace (long sheath) or be nearly fixed (short sheath).

The magnetic component 213 is composed of several ferromagnetic elements 216 fixed on the support 217' (for example in soft steel of type XC10 completed by a protection of steel plates against the oxidation/corrosion caused by washing) with the known type of glue 218'. This new block can equally be inserted into a sheath 220 of cloth or of another material, and to hem (long sheath) or be fixed (short sheath) on the inside.

Figure 17b corresponds to a cut view of magnetic elements 212 and 213.

Figure 17c presents a magnetic element band 212 in an angle view. Certain parts of the composing materials have been hidden in order to allow for the visualization of each component so that in this way one can visualize the possible arrangement of these components.

As added information, magnets 214 are of parallelipipede 6x3x1 mm arranged on two levels, components 215 are of parallelipipede 12x3X1 mm in soft steel treated for anti-corrosion of the same type which was described in reference to the support. The support is formed by a band in plastic material from 12mm in width and 0,2 mm

in thickness. The component band 212 to a width of 14 mm and a thickness of 3 mm. All these values correspond to a given application for a given use.

Figures 18a and 18b correspond to two possible applications of assembly method of magnetic elements of figures 17 according to the arrangements of the magnets of figures 15 and 16.

Figure 18a shows two complimentary magnetic elements 221 and 222.

The magnetic element 221 is composed of a simple alternating of magnets 225 and 226 of different thicknesses, fixed by an element 231'' (glue) to ferromagnetic elements 215 of the same thickness. The whole thing is fixed on a support 230 with a known type of glue 231. The block in this way constituted is complimentary with the magnetic element 221 and can slide or stay fixed in a sheath 233 in cloth or another material.

Figure 18b shows two magnetic components 220 and 224 of complimentary forms.

Magnetic element 223 is composed of a double alternating of magnets 225 and 226 of differing thicknesses fixed to ferromagnetic elements 227 in soft material of a constant thickness.

The magnetic component 224 is composed of a double alternating of ferromagnetic elements 228 and 229 of different thicknesses.

The magnetic components 221, 222, 223, and 224 can be on one or several layers. For your information, one can use magnets 225 of a thickness of 1.5 mm, magnets 226 of thickness 0.5 mm, ferromagnetic complimentary components 228 and 229 of respective thicknesses of 0.5 mm and 1.5 mm, and components 227 of thickness 1 mm.

Figures 18c and 18d correspond to two possible applications of assembly methods of magnetic components of figures 17.

Figure 18c shows two magnetic complimentary components 234 and 235 allowing for the formation of a ferromagnetic "U" around a row of magnets.

Magnetic component 234 is composed of one or several magnets 236 that are fixed with one or several rows of ferromagnetic elements 237 in soft material for example soft steel.

On one of the block ends in this manner constituted, one comes to glue, soder, or fix by another device 241, a ferromagnetic element in soft material 239 that the height is inferior to the thickness of the block in order to permit the complimentarity with element 235.

Magnetic element 235 is composed of one or several rows of one or several ferromagnetic elements in soft material 238, soft steel, where one comes to glue, soder, or fix it by another device 242, on one of the ends, one or several ferromagnetic elements 240 that the

height is superior to the thickness of the block in order to permit a complimentarity of form with component 234.

Figure 18d shows two complimentary magnetic elements 243 and 244 allowing for the" locking up of a row of magnets in an environment of ferromagnetic elements.

The magnetic element 243 is composed of one or several rows of one or several magnets 236 fixed 5(s) with one or several rows of ferromagnetic elements 237. On the two extremeties of this block in this manner constituted, on comes to glue, soder, or fix by all other means 241 and 241' of ferromagnetic elements 239 and 239' that the height is inferior to the thickness of the block in order to permit the complimentarity with component 244.

Magnetic element 244 is composed of one or several rows of one or several ferromagnetic elements, to fix by other means 242 and 242', on the two ends, of ferromagnetic elements 240 and 240' that the height is superior to the thickness of the block in order to permit the complimentarity with component 243.

The two systems of magnetic closure of figures 18c and 18d present the advantages to increase the surfaces surrounding the magnets and therefore the effect of the locking. Moreover, the components 240, 240' alow for the creation in translation by a mechanical stop between the magnetic complimentary components 234 and 235, 243 and 244.

As added information the components 236, 237, 238 can be of thickness 1 mm and components 239, 239', 240, 240' can have a height of 1.6 mm. The ferromagnetic elements 237, 238, 239, 239', 240, 240' can be implemented in soft steal treated for anti-corrosion.

Figures 19a and 19b show the appearance of magnetic fields of magnets of assembly methods of magnetic components of figures 17 and 18.

Figure 19a shows a magnetic classic closure 245 composed of two rows of magnets 247 that have alternating polarities, as previously described. The magnetic fields 248 result from the interaction of to rows of magnets 247 and form a lock thanks to the alternating of polarities. The component 246 represents the constituted separation by the sheaths in which the blocks of magnets are inserted.

Figure 19b shows a magnetic closure 245' composed of one or several rows of magnets 247, of alternating polarities, with a part, and of others, one or several rows of ferromagnetic elements 249 and 249'. The magnetic fields 248' result from the interaction of magnets 247 and from the ferromagnetic elements 249 and 249', that are positvely and negatively charged in opposition to the polarities of magnets 247. Component 246' represents the separation constituted by the sheaths in which the magnetic blocks are inserted. This "sandwiched" configuration allows for the redirection of magnetic fields 248' of magnets 247

at the inside of ferromagnetic elements 249 and 249' and to create a lock of magnetic fields.

The configuration of figure 19b represents the advantages compared to the configuration of figure 19a, particularily in allowing:

- to close the magnetic fields and to conserve the same magnetic power with two times less magnets,
- to decrease the cost of the closing,
- to decrease the interaction of the magnetic fields with the exterior

Figure 19c shows another assembly method of a device according to the invention which makes two identical pieces opposing each other appear, each one corresponding to the superior part of figure 196.

In this context, one can adopt the following values:

- indicated thickness of magnets 247, 247': 0,5mm or 0,8mm,
- indicated thickness of the soft steel plates (248, 249, 248', 249') : 0,8 to 1,0 mm.

This means that the total thickness of the system is T = 1,6 + 2 = 3,6mm instead of 4,5mm without doubling the pieces and this with similar magnetic power.

Figures 20a to 20d show another assembly method of magnetic elements usable with the invention because they slide with or without sheaths. The magnetic elements are represented in a cut view and the sliding connections are symbolized in an angle view.

Figure 20a shows a magnetic component 263 assembled as before (this is to say in this case two rows of magnets 250 fixed on a support 251 with a known type of glue 252) of which the two ends are pierced with cylindrical holes 254 and 254'. The piercings 254 and 254', of circular type, allow for the passage of thread or other elements of the round section 253 and 253' to go through, which assures the guiding in translating the magnetic component 263.

Figure 20b shows another magnetic component 264, similar to 263, but with piercings of a square section 256 and 256' allowing the guiding components to go through in translation for example formed by rigid or supple stem stitches of the square sections 255 and 255'.

Figure 20c shows a magnetic component 265 composed of two layers of magnets 250 fixed on a support 251 with a known type of glue 252 and of which the support 151 is covered with glue 252. This magnet component 265 is pierced 4 times; to cylindrical piercings 258 and 258' on each end and two other piercings 260 and 260' in the superior part. Each piercing allows for the insertion of a string or round section element 258, 258', 260 or 260' which assures the guiding in translation to the magnetic element 265.

Figure 20d shows magnetic component 266, similar to 265 but with only circular piercings 262 and 262' in the superior part of the band that forms the component, allowing for the passage of the guiding components of translation of the round section 261 and 261' to go through. This configuration allows to free the sides of the magnetic component 266.

The different configurations of figures 20a to 20d given as an example allowing to guide a magnetic component which is either at the inside of a sheath or with an open sheath (see figure 22a and 22b) or without a sheath. The represented magnetic components are composed of two rows of magnets but there can also be one or several rows.

The quality of the guiding depends on the type of guides used (form of the section, size of the section, material used) and of the number of the piercings. In the configurations of figures 20c and 20d, the guides can have square sections or sections of another form.

As added information, using metallic guides (for example type iron string) allows for a more precise guiding of the magnetic component than using linen string for example. On the contrary, the linen string allows to better follow a complex contour like a part of the body. The choice is made in relation with the desired application.

Figures 21a and 21b show another assembly method of magnetic elements, usable with the invention, guided in translation without a sheath.

Figure 21a shows a magnetic element 276 composed of two rows of magnets 268 with, on every side, of parallelepipedic components 269 and 269' that are fixed in magnets 268 by glue, sodering or other fixing system.

The block is therefore placed and fixed on a support (267) by gluing, sodering or other system of fixing 275.

Support 267 can be rigid or supple according to the desired applications. Elements 269 and 269'

represent the piercings 270 and 270' which allows the linear guiding of the magnetic component 279 with the strings or components of the round section 271 and 271'. The section of components 271 and 271' can be square or of another form.

Figure 21b shows a magnetic component 277, similar to the component 276, with guiding supports 272 and 272' laterally opened towards the outside, presenting slits 273 and 273'. These slits 273 and 273' have rectangular sections and take in the guiding components 27' and 274' of the square section.

Figures 22a and 22b show two magnetic elements 278 and 279 respectively inserted in open sheaths 285 and 286, which allows a direxct contact of metal on metal, without fabric in between.

Such an arrangement will allow to reduce the number of magnets and therefore the price at the same magnetic strength.

Magnetic component 278 is composed of one or several rows of magnets 280 fixed on a suupport 282 with a known type of glue 281. The support 282 is embedded in the glue 281 and two or several piercings 283 are made in the superior part of the magnetic component 278. These piercings 283 allow the passage of guiding elements 284 that allow the translation of magnetic element 278. Guding elements 284 are fixed at the open sheath 285 by gluing, sodering, sewing, or other system.

Magnetic element 278 is composed of several rows of magnets 280 fixed on a support

282' with a known type of glue 281'. The magnetic component 278 is fixed on an open sheath 286 by gluing, sodering, sewing or other system.

Figure 22b shows more exactly the two magnetic components 278 and 279 in a view from an angle. The sheath 285 is not represented in order to show the magnetic component 284 and a possible guiding system 284. The magnetic component 284 can in this manner slide in order to adjust the closing. The component 279 stays fixed at the inside of the open sheath 286.

The same type of open sheaths with with added soft steel plates (idem figure 19c) or in replacing of the magnets (figure 19b) is possible here.

Figures 23a to 23b show another assembly method of magnetic elements 287 and 288 usable with the invetion that allows to close or adjust a garment or any other application.

Figure 23a shows two magnetic components 287 and 288 that are composed, as previously, of one or several rows of magnets 289 fixed on a support 290 with a known type of glue 291. Magnetic component 287 is inserted into a long type of sheath 292 and is fixed on the inside.

The magnetic component 288 remains inserted in a short type of sheath 293 and remains fixed on the inside. The adjusting of the closure is not done by the sliding of the magnetic component as compared with the other but by direct positioning of a short magnetic component 288 on a long magnetic component 287.

The number of magnets 289 per row of magnetic component 287 depends on the range of desired adjustment. The number of magnets 289 per row of magnetic component 288, in this manner that the number of rows depends on the necessary magnetic power. Figure 23a corresponds to a "large" adjustment of the closure.

Figure 23b shows an intermediary position of an adjustment of the closure of the magnetic components 287 and 288.

Figure 23c corresponds to a "tight" adjustment of the closing.

This method of adjustment can as well allow an adjustment of the magnetic power of the closing by positioning more or less magnets of the magnetic components 288 opposing the magnets of the magnetic component 287. The higher the number of the' magnets in contact the higher is the magnetic power of the closing. In this case, the adjustment is done by sliding a magnetic component into the interior of its sheath.

This type of sheath can therefore be open (idem figure 22a) in order to reduce the number of magnets (=cost) and to make the system lighter.

Figure 24 shows a shoe 300 with a tongue 301 equipped with a device 302 shown schematically in 302' as well according to an assembly method of the invention.

The shoestrings are here replaced by the sheath 303 containing two blocks of articulated magnets 304 and 305.

One 304 is mobile and slides on an electric circuit 306 (306') placed in a sheath 303. This circuit consists of for example, glued contacts

on a supple PVC film, which makes it possible to obtain a circuit which is easily adaptable due to its great suppleness.

The other magnet 305 is fixed in the mentioned sheath.

Six LEDs 308, 308', where a light component 309 pierces the surfaces of the sheath, indicates the level of welding.

They are fed by the above mentioned circuit 306.

More precisely, it consists of two conductor strips 310 and 311 that are placed opposing each other and electrically isolated from each other by a support 312 (supple plastic sheet for example in rodhoide). Eaxh strip is attached to a bar opposing a battery 313 placed in the sole 314 of the shoe 300.

Sheath 301 folds back when passing over a plastic loop 319 connected to the shoe for example by two elastic points (not shown) in order to make the mobile magnet 304 cooperate with the fixed magnet 303 place in opposition.

When moving during the tightening action, the magnet 304 closes then opens different branches 315', 316', 317', ... from circuit 306' that turns on the LEDs 308'.

Finally, an interrupter 318 (318') of the circuit is provided and can be manually activated by the user.

Figure 25 represents another assembly method of a shoe 320 according to the invention in which the laces are here still replaced by a sheath 321 containing two magnet blocks, a fixed one 322 and a mobile one 323 which

will move along an electric circuit integrateed into the sheath.

This circuit is fed by a small round battery 324 (commonly used for watches), linked to eight LEDs 325 (325' son the double sketch) this time integrated not in the tongue itself but in the logo of the shoe and consists of, as in the case of figure 24, two strips 310 and 311 linked to the poles of the battery, magnet 323 creating the circuit closure opposing a specific LED during its movement.

The LEDs therefore turn on in reaction to the tightening.

The sheath goes through a stem stitch loop, for example in translucid orange PVC, mobile in rotation, adjusted to the shoe.

In this assembly method, the closure of the circuit in 325 (326') can be executed not by an interruptor, but for example by a folding and clipping of the ends of the strips 310 and 311.

Figure 26 shows another assembly method of the tongue 330 for shoe 331, the sheath passing this time through the loop 332 before refolding on itself.

This loop is therefore connected to the shoe by an elastic band 333 which, once the magnet is positioned, causes the tightening force, and the magnet 322 is fixed in the shoe, the magnet 333 moves while one pulls at the loop during the tightening. This magnet slides therefore through the electric circuti and lightens oup the diodes. So, this is a variation of the application in figure 25.

Figures 27 are views from an angle of a watch 340 with two sets of magnets 341 and 342 each set consisting of a fixed magnet 341′ and 342′ and another mobile magnet (341′′, 342′′) sliding along the length of two rails 343 made of strings of plastic material.

To close the bracelet, one has to make the fixed magnet of one branch correspond with the mobile magnet of the other branch, the adjustment being therefore possible thankds to the translation of the mobile magnets (cf. Figure 27b and 27c).

Figures 28a and 28b show another assembly method of the tongue 349 and of shoe 350 in which the laces are replaced by a sheath 351 which goes through three loops 352, 353, 354 situated in place and having holes for the laces.

The sheath contains four mobile magnets, three round magnets 355 and a magnet block 356 for example hallmarked for certain ones for a strip and rodhoide support 357, the sheath 358 of the sheath being for example in white nylon.

The end of the sheath is fixed with the side, by the bias of the magnet block 356 that cooperates with a fixed magnet block in the shoe. Three other magnets interact with similar magnets fixed to the shoe. The sheath is in this manner maintained in position.

To tighten, one has to pull on the tongue then one flattens the end of the sheath against the shoe in order to maintain the adjustments.

Figures 29a to 29c show another assembly method of a shoe 360 according to the invention in which this last mentioned one consists of two sheaths

361 and 362 that are symmetrically opposing, forming for each one a transversal loop with a longitudinal 366 returning around what from what passes the loop, mobile magnets 363 in the sheaths being placed towards the end of the tongues and coming to cooperate with a fixed magnet 364 placed on a part of the tongue 365 bound up with the shoe.

In certain assembly methods one can as well plan two parallel sets of transversal tongues.

Figures 30a to 30c show an assembly methods of bag 370, using a device 371 of magnets according to an assembly method of the invention. Device 371 will allow a horizontal closure (see figures 30b and 30c) of the bag where the opening is adjustable by the moving (arrows 372) magnets (373) contained in the sheath 374 fixed on the higher part on the trim of the bag.

Figures 31a and 31c represent another assembly method for a bag 380 with an adjustable flap 381. The flap 381 can be adjusted in relation to the bulk of the bag contents thanks to the mobile magnets 382 in vertical sheaths 383 on the lengths of the lateral peripheral edges 384 of the bag flap, that comes to cooperate with fixed magnets 365 fixed to the side in front of the mentioned bag.

Figures 32a and 32b show a skirt 390 equipped with magnets 391, 392; 393, 394, inserted in respective sheaths 395,396, which have different compartments, allowing for a fixing of the skirt at the level of the belt, two of the magnets 391, 394 being of complimentary form of which one part is thicker than

the other, in a way that one comes to block one upon the other.

In the belt, one of the components is fixed on one side and mobile on the other side of the belt.

Figures 33a and 33b show an open and closed garment, equipped in order to replace each of its buttons, on one side (which is for example the side of the opening) of fixed magnets 401 alternatively of signs + - + and on the other side of mobile magnets 403, 404 in tge sheaths 405, of opposing signes and being capable to cooperate with the fixed magnets.

As it results from those preceding it, the present invention is not limited to the assembly methods more particularly described. On the contrary, it embraces all the alternatives in particular:

- the " anti-pulling off" bra . It contains an alarm which goes off if the bra is torn off. This system can make it possible to escape from an attacker.
- the hand bag with alarm. This bag is equipped with a handle which, when the bag is pulled remains in the hand of the user. This handle is connected by magnetic contact to the rest of the bag by a wire which starts from a battery towards a magnet which can be located at the top of the bag. This magnet is in contact with a second magnet on the handle. This handle contains a wire which leaves the magnet quoted above, towards a third magnet. This third magnet is fixed by magnetic contact to a fourth magnet which can be located at the top of the bag. This fourth magnet is connected to a wire which goes to a relay.

In the event of pulling, the relay is not energized by a battery and sets off an alarm. The robber thus finds himself with a bag which emits a siren or a vocal message " Purse snatcher! Purse snatcher!"

- the bra "operated by remote control and remotely adjustable" facilitates dressing and undressing handicapped people or people with reduced mobility.
- the garter belt with alarm, if one of the four supports of the garter belt loosens, an alarm goes off.
- magnet closing used on the strap that surrounds the umbrella when it is closed.
- the sweat-belt with closing magnetic system instead of the Velcro® system, which after several uses, and under the effect of heat, loses its sticking properties.
- the tie with pre-established node. The node consists of a magnet or magnetic component that will be joined to the magnet or mobile magnetic component located on the neckline and will adapt to the user's movements.
- sport gloves with a magnetic closing and adjustment system according to devices' envisaged by the invention.
- Protection equipement such helmets, elbow and knee pads...with a magnetic closing and adjustment system instead of traditional closing systems.

The magnets can be advantageously covered one by one with a protection layer resulting from the nickel/gold or

nickel/nickel/gold galvanization that will avoid the rusting of the magnets thereby making the magnets hypo-allergenic.

As one has seen, the described invention brings along numerous applications in different sectors, such as:

- corsetery: bras, garder-belts, guepières, corsets, underwear
- shoes and associated items: sport shoes, street shoes, ski boots, boots, roller skates, ice skates
- hats: baseball hats, stocking hats, hats, kepis
- clothes: jackets, shirts, blouses, pants, bermuda shorts, skirts, dresses, coats, overalls, detachable hoods
- cloth diapers, sanitary napkins
- medical material: adjustable/detachable splints, dentist's bib
- clothing accessories: belts, suspenders, gloves, mittens, ties; and bow-ties
- protection accessories: motorcycle helmets, bike riding helmets, construction helmets, horseriding helmets, knee braces, elbow braces, shin guards, chest protectors
- fashion accessories: watches, bracelets
- underwater materials and accessories
- luggage: suitcases, backpacks, sport bags, shoulder bags, purses, document bags, hand bags

- school and office supplies: organizers, folders, shirts, schoolbags
- clothes pins/pegs